Response to FERC AIR WQ -5

ADDITIONAL GEOMORPHOLOGY INFORMATION

Klamath Hydroelectric Project
(FERC Project No. 2082)

PacifiCorp
Portland, Oregon

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ADDITIONAL GEOMORPHOLOGY INFORMATION

1. INTRODUCTION

This report is submitted in response to Additional Information Request (AIR) WQ-5 from the Federal Energy Regulatory Commission (FERC) to PacifiCorp (by letter dated February 17, 2005) for additional geomorphology information related to the Klamath Hydroelectric Project (Project) located along the upper Klamath River in Klamath County, south-central Oregon, and Siskiyou County, north-central California. The information provided in this report augments and clarifies previous material on geomorphology studies that is contained in PacifiCorp's Final License Application (FLA) for the Project filed with FERC in February 2004.

This report provides additional information on three specific tasks requested by FERC in AIR WQ-5:

1. Provide available current and historic empirical information on channel conditions (channel form, elevation, and substrate composition) downstream of Iron Gate dam.
2. Provide available current and historic aerial photographs (in electronic format) thatwere collected for PacifiCorp's analysis of the Klamath River from Link River dam to Seiad Valley.
3. Revise the sediment budget data presented in Table 6.7-19 and Figures 6.7-59 through 6.7-63 of the Water Resources Final Technical Report (PacifiCorp 2004) so that both include every "node" or "process" within the sediment budget, and each node or process contains all the input information necessary to allow for a full examination of the budget's components and variables.

2. AVAILABLE CURRENT AND HISTORIC EMPIRICAL INFORMATION

Chapter 6 of the Water Resources Final Technical Report (PacifiCorp 2004) provides all of the current and historic empirical information that is available on channel conditions (channel form, elevation, and substrate composition) downstream of Iron Gate damThe data from PacifiCorp's geomorphology study (as discussed in PacifiCorp 2004) included six study sites downstream of Iron Gate dam where data was collected on surface sediment particle sizes, channel geometry, and channel slope.

Section 6.7.4 of the Water Resources Final Technical Report (PacifiCorp 2004) provides a review of previous studies that PacifiCorp is aware of that provides geomorphology information downstream of Iron Gate dam. These studies include:

- Klamath and Shasta Rivers Spawning Gravel Enhancement Study (Buer 1981)
- Geomorphic and Sediment Evaluation of the Klamath River, California, Below Iron Gate Dam (Ayres Associates 1999)

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- River Channel Morphological and Sediment Changes in the Klamath Basin, Oregon and California (McBain and Trush 1995)

Of these studies, Ayres Associates (1999) provides the most additional geomorphological data for the Klamath River downstream of Iron Gate dam. General measurements of slope, sinuosity, channel width, and valley width were made from available maps. Channel geometry characteristics were measured at six sites downstream of Iron Gate dam. Wolman pebble counts and bulk samples were collected near some of the study sites. Table 1 summarizes the geometry and sediment data for each study site from Ayres Associates (1999).

Table 1. Summary of Ayres Associates (1999) geomorphology data downstream of Iron Gate dam.

Site Number	Site Name	River Mile	Geometry Data	Sediment Data
1	Below Blue Creek	16.3	10 cross sections	4 pebble counts; 2 bulk samples
2	At Sandy Bar	77	10 cross sections	2 pebble counts; 2 bulk samples
3	At Happy Camp	106	10 cross sections	2 pebble counts; 2 bulk samples
4	At Portuguese Creek	128	10 cross sections	2 pebble counts, 2 bulk samples
5	At Beaver Creek	161	10 cross sections	no sediment samples
6	At Little Bogus Creek	187	10 cross sections	no sediment samples

PacifiCorp does not have any of the original data from this study. Finally, it should be noted that study sites one through four from the Ayres Associates (1999) study were located downstream of the study sites presented in Section 6 of the Water Resources Final Technical Report (PacifiCorp 2004).

Library research was preformed at the University of California Berkeley to locate additional information about the Klamath downstream of Iron Gate Dam. No new sources of information were found that were not included in the Water Resources Final Technical Report (PacifiCorp 2004). Additionally, researchers at the University of California were contacted and asked about research being conducted on the Klamath River. Research is being conducted on the tributaries to the Klamath River in the Klamath National Forest, but no results have been published at this date (C. May, pers. comm., 2005).

3. AVAILABLE CURRENT AND HISTORIC AERIAL PHOTOGRAPHS

FERC AIR WQ-5 (Geomorphology Information) requests that PacifiCorp provide "[a]ll available aerial photographs (current and historic) that were collected for the analysis of the Klamath River from Link River dam to Seiad Valley in electronic format".

PacifiCorp has an extensive collection of current and historic aerial photographs that were obtained for use in our geomorphology study as presented in the Water Resources Final Technical Report (PacifiCorp 2004). A table is enclosed in Apendix A of this report that provides a complete listing of these aerial photographs (note: this listing was previously provided to FERC in a letter from PacifiCorp dated April 18, 2005). PacifiCorp has most of these aerial

photographs only in hardcopy form, and only those aerial photographs that appear in the geomorphology analysis in the Water Resources Final Technical Report (PacifiCorp 2004) are available in electronic format.

For our response to AIR WQ-5, PacifiCorp assumes that FERC seeks only those aerial photographs that appear in the Water Resources Final Technical Report (PacifiCorp 2004) and are already in electronic format. PacifiCorp provides a companion CD with this report that contains these aerial photographs in electronic (JPEG) file format. These filesare listed in Table 2.

Table 2. Aerial photographs available in electronic (JPEG) format used by PacifiCorp in geomorphology studies for the Klamath Hydroelectric Project (PacifiCorp 2004).

Reach	Photo Electronic File Name (JPG format)	Photo Year	Photo Date	Down-stream Limit (RM)	Upstream Limit (RM)	River Flow (cfs)	Scale
Link	Link1979Q1220cfs	1979	6/8	245	255.5	1220	1:40000?
	Link1994Q1090cfs	1994	7/8	253.0	255.5	1090	1:12000
Keno	Keno1960Q680cfs	1960	8/17	230.5	236.0	802	1:20000
	Keno1994Q342.cfs	1994	7/9	230.8	236.0	342	1:12000
Boyle	BoyleBypass1952Q1550cfs	1952	8/10	218.5	224.0	1550	1:15000?
	JCBShovel1955Q1530cfs	1955	8/11	204.5	209.7	1430	1:24000
	JCBGorge1968Q779cfs	1968	6/21	211.0	216.0	779	1:24000
	JCBFrainRanch1968Q779cfs	1968	6/21	214.0	221.5	779	1:24000
	JCBGorge1993Q895cfs	1993	8/25	205.3	216.5	895	1:40000?
	JCBFrainRanch1993Q895cfs	1993	8/25	211	226	895	1:40000?
	BoyleBypass1994Q300cfs	1994	7/9	221.5	224.5	508	1:12000
	JCBShovel2000Q1110cfs	2000	8/14	202	210	830	1:24000
Copco	Copco1955Q1320cfs	1955	8/2	196.0	200.5	1320	1:24000
	Copco1993Q10cfs	1993	8/1	189.0	202.0	?	1:40000?
Below Iron Gate	DSIGDKlamathon1944Q1280cfs	1944	8/4	177.0	181.5	1280	1:24000
	DSIGDHatchery1955Q852cfs	1955	8/9	185.0	191.0	1530	1:24000
	DSIGDRM1701955Q1540cfs	1955	8/11	169.0	175.0	1430	1:24000
	DSIGDRM1401955Q1280cfs	1955	8/17	140.0	147.0	817	1:24000
	DSIGDKlamathon1994Q572cfs	1994	7/25	178.0	187.0	579	1:40000?
	DSIGDRM1701999Q1130cfs	1999	8/19	167.5	173.0	1130	1:24000
	DSIGDRM1401999Q1130cfs	1999	8/16	138.0	142.0	1130	1:24000
	DSIGDHatchery2000Q1010cfs	2001	7/14	186.5	196	1010	1:40000

4. SEDIMENT BUDGET CLARIFICATIONS AND REVISIONS

FERC AIR WQ-5 (Geomorphology Information) requests that PacifiCorp provide the following information related to the sediment budget constructed for the Project area:

- Modify sediment budget to include feeding of cells from the upstream reaches.
- Provide Excel-format spreadsheets that contain all formulas, data, and results in a modifiable format.
- Ensure sediment flux resulting from floodplain and in-channel storage is factored into each cell of the sediment budget
- Revise Table 6.7-19 and figures 6.7-59 through 6.7-63 to include all "nodes" or "processes" within the sediment budget.
- Provide the total annual volume of sediment contributed by each source/tributary.
- Provide the annual sediment flux for all other sources and sinks in the cell/reach.

4.1 Methods

The development of the original sediment budget is presented in Section 6.4.15 of the Water Resources Final Technical Report (PacifiCorp 2004). The modifications made to the original sediment budget materials are summarized below along with a brief summary and discussion of revised results. The following documents were developed in response to this AR WQ -5.

4.1.1 Spreadsheet of Sediment Inputs, Transport Capacities, and Average Annual Deficits or Surpluses

The Excel spreadsheet titled "*MasterSedimentBudget051105.xls*" (contained on the companion CD to this report) shows all sediment inputs, transport capacities, and average annual deficits or surpluses for each node and Project study reach. Nodes in this spreadsheet are defined as any input, in-channel project structure, or reach boundary. Although inputs are shown at each node, the original sediment budget was developed for assessment at the reach scale and was based on an average transport capacity for each Project study reach. As a result, it is not appropriate to evaluate the average annual sediment deficit or surplus at each node.

This sediment budget includes the Klamath River from the Link River Project study reach to Seiad Valley. The watershed areas, sediment yields, and classes of sediment yield are included for each cell. Connectivity factors are explicitly stated and described. Theoretical average annual sediment transport capacity is presented for each reach and the resulting sediment deficit or surplus is stated. Descriptive notes were added to the spreadsheet to clarify the methods used to estimate the sediment inputs for each Project study reach (Table3). This spreadsheet replaces Table 6.7-19 in theWater Resources Final Technical Report (PacifiCorp 2004) .

Table 3. Methods used to estimate inputs to the sediment budget by Project study reach.

Reach	Method Used to Estimate Sediment Delivery to the Klamath River
Link	Only two small tributaries were identified in this reach and sediment delivered to the mainstem was limited by depositional zones either near the mainstem or in upland meadows. The sediment inputs to this reach were estimated by multiplying a low connectivity rate by the watershed area. The watershed area for the Link reach was derived by taking the difference of the watershed area at the Link River Gauge and the Keno Gauge published by the USGS. The connectivity factor of 0.01 was based on professional judgment of the GSG and comparison with the measured tributary delta deposits. Historically, a large percentage of the bed load in the Klamath River would have been deposited in Lake Ewauna. Therefore, the sediment input value presented for the Link River Project Reach most likely overestimates the contribution of bed load sediment to the channel.
Keno	Although 17 tributaries were identified as being directly connected to the mainstem, a low (0.25) connectivity factor was applied to the watershed area of the reach. The watershed area was determined by taking the difference between the watershed areas at the Keno gauge and the JC Boyle gauge. The connectivity factor was applied to the watershed area instead of the individual tributaries because the GIS algorithm used to determine watershed boundaries in other reaches was unable to accurately delineate the tributary watershed boundaries from the DEM. Many of the tributaries have flat meadows that limit sediment delivery to the mainstem. Subreach watershed areas and sediment yields were calculated as a percentage of the length of the reservoir by the total reach length. Most likely this method will overestimate the production of sediment from surfaces that are not connected to the mainstem by a channel.
J.C. Boyle	Sediment input to the J.C Boyle Reach was determined by multiplying the watershed area of each identified tributary by a connectivity factor. Connectivity factors were determined by weighting the sediment yield value from the tributary delta surveys at Scotch, Camp/Dutch, Jenny, and Spencer Creeks. Scotch, Camp, and Dutch creeks had a yield of 197 tons/mi^2/yr, which was considered a high sediment yield for the upper basin based on the extent of their delta deposits. Tributaries with high channel gradients and without depositional zones were considered to be well connected and were assigned a weight of 1.0 (i.e. their sediment yield was assumed to be the same as that measured for Scotch/Camp/Dutch creeks). Tributaries with shallower slopes and/or some depositional zones upstream were classified as medium in connection, and were assigned a weight of 0.5 (i.e. their sediment yields were assumed to be 0.5 of that measured for Scotch/Camp/Dutch creeks). Tributaries with shallow slopes and extensive depositional areas upstream of the mainstem were assigned a weight of 0.25 (i.e. their sediment yields were assumed to be 0.25 of that measured for Scotch/Camp/Dutch creeks). Watersheds that appeared to be disconnected with respect to sediment transport by extensive depositional zones upstream of the confluence were classified as nearly disconnected and assigned a value of 0.01. Connectivity factors for this reach ranged from low (0.25) to high (1.0).
Copco	Scotch, Camp, Dutch, and Jenny creeks and an unnamed “Tributary a” (UN Trib a) cover 90 percent of the watershed area of the Copco Project Reach. Sediment inputs were calculated by multiplying the watershed area of each creek by a connectivity factor derived from tributary delta surveys as described above. The sediment input from the remaining 10 percent of the watershed area was calculated by applying a low connectivity factor (0.25) to the watershed area. Applying the connectivity to watershed areas that are not directly connected to mainstem by a channel most likely overestimates the sediment input.
Downstream of Iron Gate	For the reach from Iron Gate Dam to Seiad Valley, two different tributary sediment yields were used to adjust for the change in geologic units that occurs near Cottonwood Creek. Sediment yield for Salmon River from de la Fuente and Hessig (1993) was applied to all tributaries downstream of Cottonwood Creek. This yield was determined by the GSG to underestimate the amount of sediment delivered to the Klamath River by other tributaries downstream Therefore, this value was not reduced by 20% to account for the suspended load as occurred for the upstream sediment yields. For the reaches upstream of Cottonwood Creek, the yield derived from the tributary delta surveys was multiplied by the watershed area of each tributary to the Klamath River.

The sediment flux resulting from floodplain and in-channel storage was not factored into each cell of the sediment budget. This decision was based on our analysis of historical aerial photography. The historical photographs did not show significant changes in bars or mid-channel islands, suggesting that the sediment flux between these features has remained relatively stable over the length of each Project study reach. Therefore, floodplain and in-channel storage was determined not to be a significant sediment source or sink and both were omitted from this sediment budget. A more detailed analysis of the flux on in-channel and floodplain sediment storage could be undertaken using rectified series of aerial photographs in GIS to make detailed measurements of in-channel and floodplain features. However, this was not deemed necessary by the Geomorphology Subgroup (GSG) during the development of the sediment budget.

4.1.2 Revised Figures 6.7-59 through 6.7-63 from the Water Resources Final Technical Report (PacifiCorp 2004)

Figures 1 through 7 contains the revised Figures 6.7-59 through 6.7-63 that originally appeared in the Water Resources Final Technical Report (PacifiCorp 2004). These revised figures illustrate all tributary inputs that were directly measured from GIS and included in the sediment budget. The sediment transport capacities and sediment yields were included to illustrate sediment flux within each Project study reach. The spreadsheet *MasterSedimentBudget051105.xls* (contained on the companion CD to this report) and the sediment budget schematics in Figures 1 through 7 are linked by tributary name and river mile. Note that Figures 3, 4, and 5 comprise the original Figure 6.7-61 broken into three figures.

4.1.3 Spreadsheet of Average Annual Sediment Transport Capacity

The Excel spreadsheet titled "*AvgAnnualTransportCapacity.xls*" (contained on the companion CD to this report) lists the average annual sediment transport capacity for each of the study sites (in the tab in this spreadsheet called "*raw_transport_daily*"). This spreadsheet also includes hydraulic data used to derive the sediment transport capacity on tabs named for each reach.

4.1.4 Spreadsheet of Tributary Sediment Yields

The Excel spreadsheet titled "*TribSedYield.xls*" (contained on the companion CD to this report) summarizes the sediment yields from the tributary delta surveys (see Appendix 6B in the Water Resources Final Technical Report (PacifiCorp 2004)).

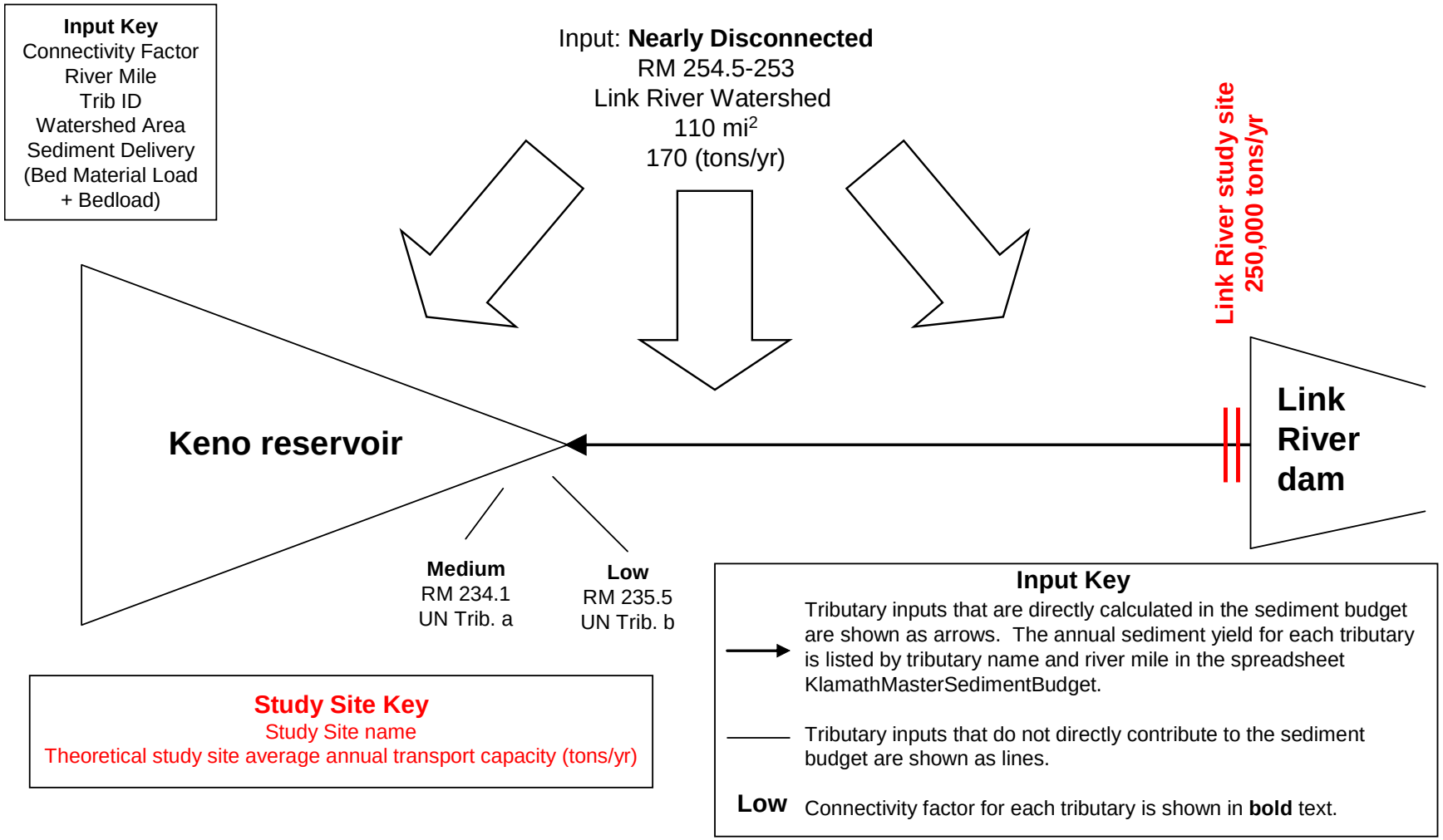

Figure 1. Link River Reach Sediment Budget Schematic (revised Figure 6.7-59 from PacifiCorp 2004). Input obtained by applying a connectivity factor (see note on *KlamathMasterSedimentBudget* spreadsheet in companion CD to this report) to the watershed area of the Link River Project reach. The watershed area was calculated by taking the difference in area between the USGS Link River and Keno gauges.

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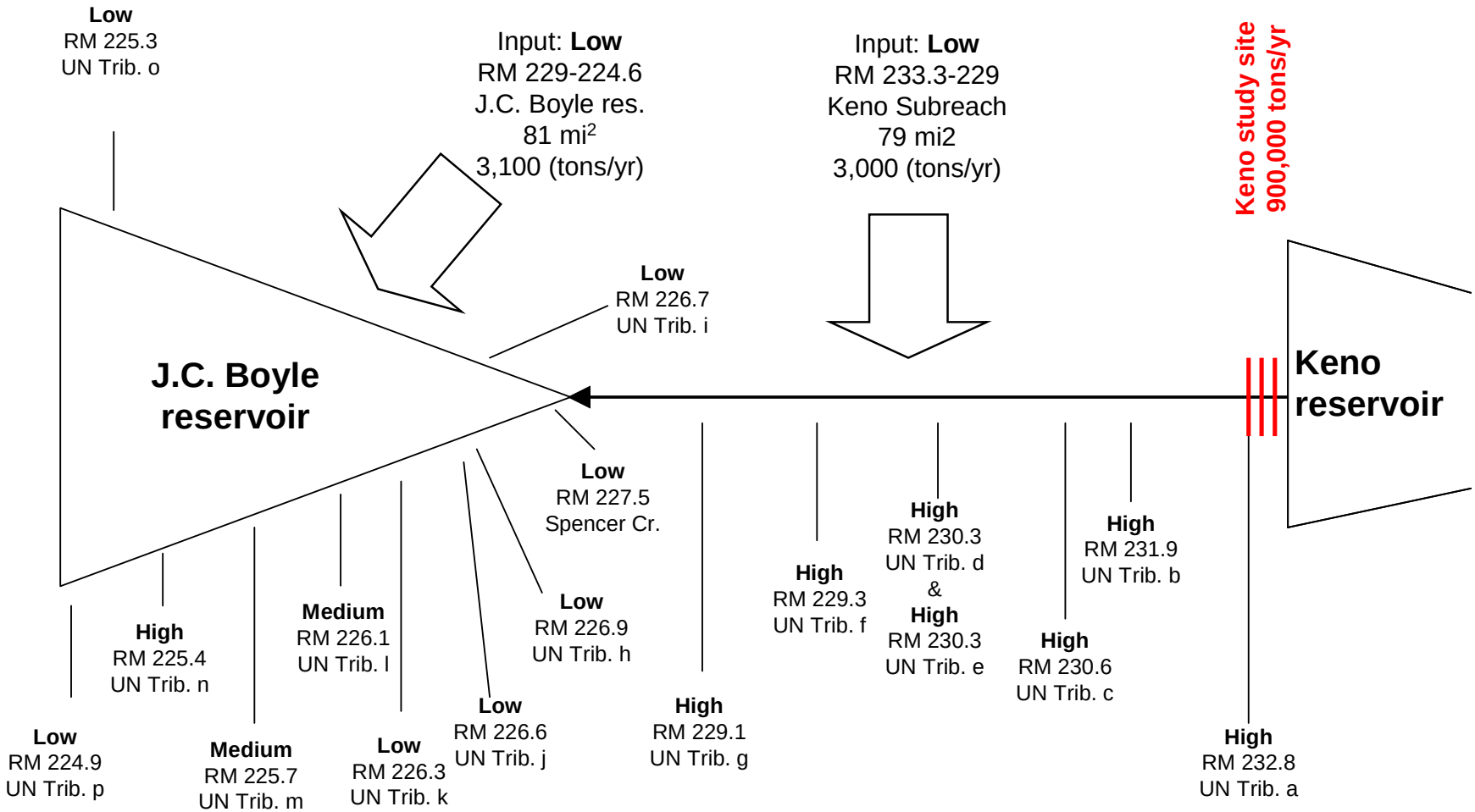

Figure 2. Keno Reach Sediment Budget Schematic (revised Figure 6.7-60 from PacifiCorp 2004). Input obtained by applying a connectivity factor (see note on *KlamathMasterSedimentBudget* spreadsheet in companion CD to this report) to the watershed area defined by the difference in area between the Keno and J.C. Boyle gauges. Inputs are proportional to the length of the Keno Subreach and J.C. Boyle reservoir (79 mi2 and 81 mi2 respectively).

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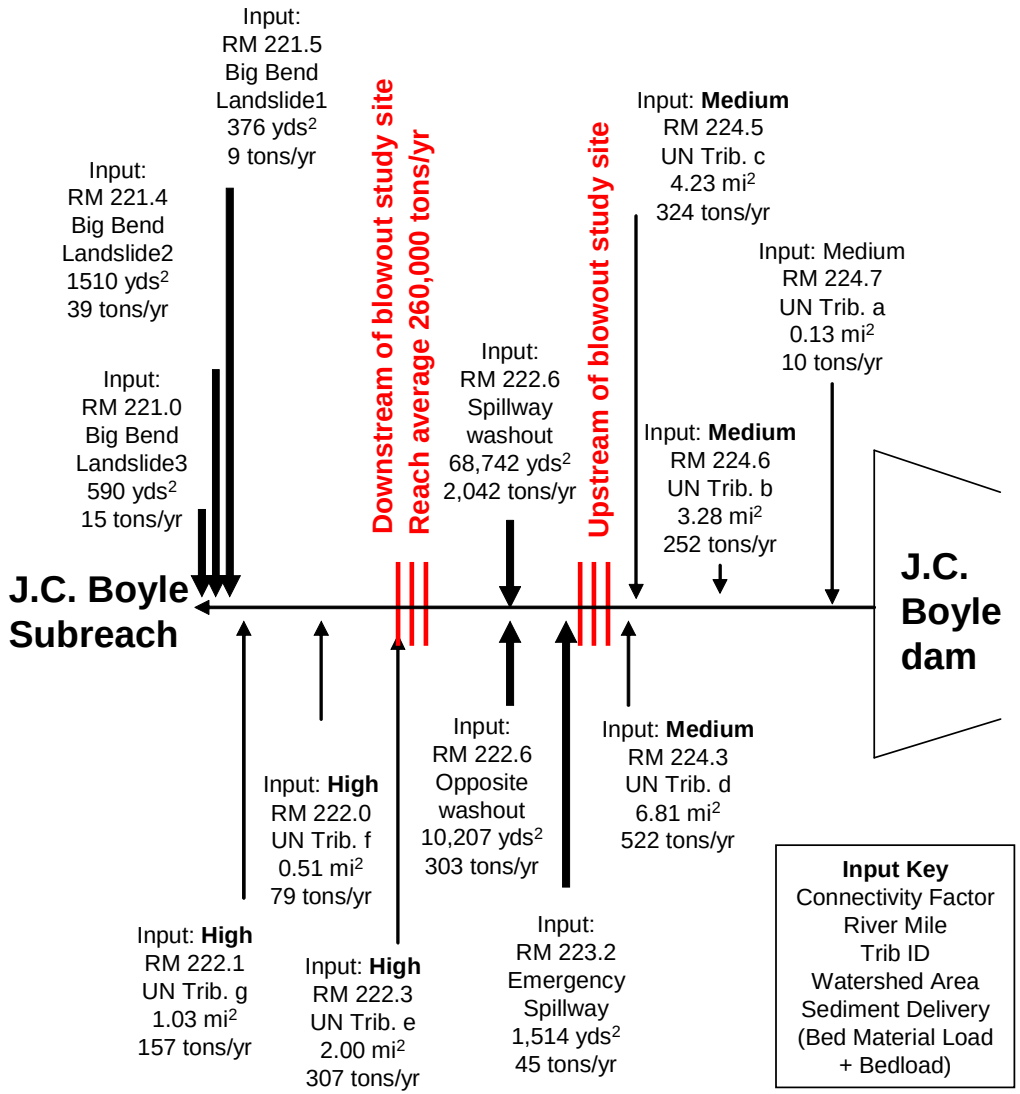

Connectivity Factors

Connectivity factors were assigned based on qualitative topographic analyses of the connection between tributaries and the mainstem. Tributaries with low connectivity typically had upstream storage zones that were assumed to limit sediment delivery to the mainstem Klamath River. Examples of upstream storage zones include upland meadows and valleys with gentle slopes and long, flat reaches adjacent to the mainstem. Tributaries with high connectivity to the mainstem Klamath River typically had consistently high slopes from the headwaters to the confluence with the mainstem. Tributaries with medium connectivity exhibited some combination of the characteristics of the low and high connectivity tributaries. The factors applied to yields from each tributary are summarized below.

Keno, J.C. Boyle, & Copco Reaches

Rating	Multiplier
Low	0.25
Medium	0.5
High	1.00

Link Reach

Rating	Multiplier
Nearly Disconnected	0.01
Low	0.25
Medium	0.50
High	1.00

Figure 3. J.C Boyle Reach (Bypass Subreach) Sediment Budget Schematic (portion of revised Figure 6.7-61 from PacifiCorp 2004). Also contains information on derivation of connectivity factors for Keno, J.C. Boyle, and Copco reaches.

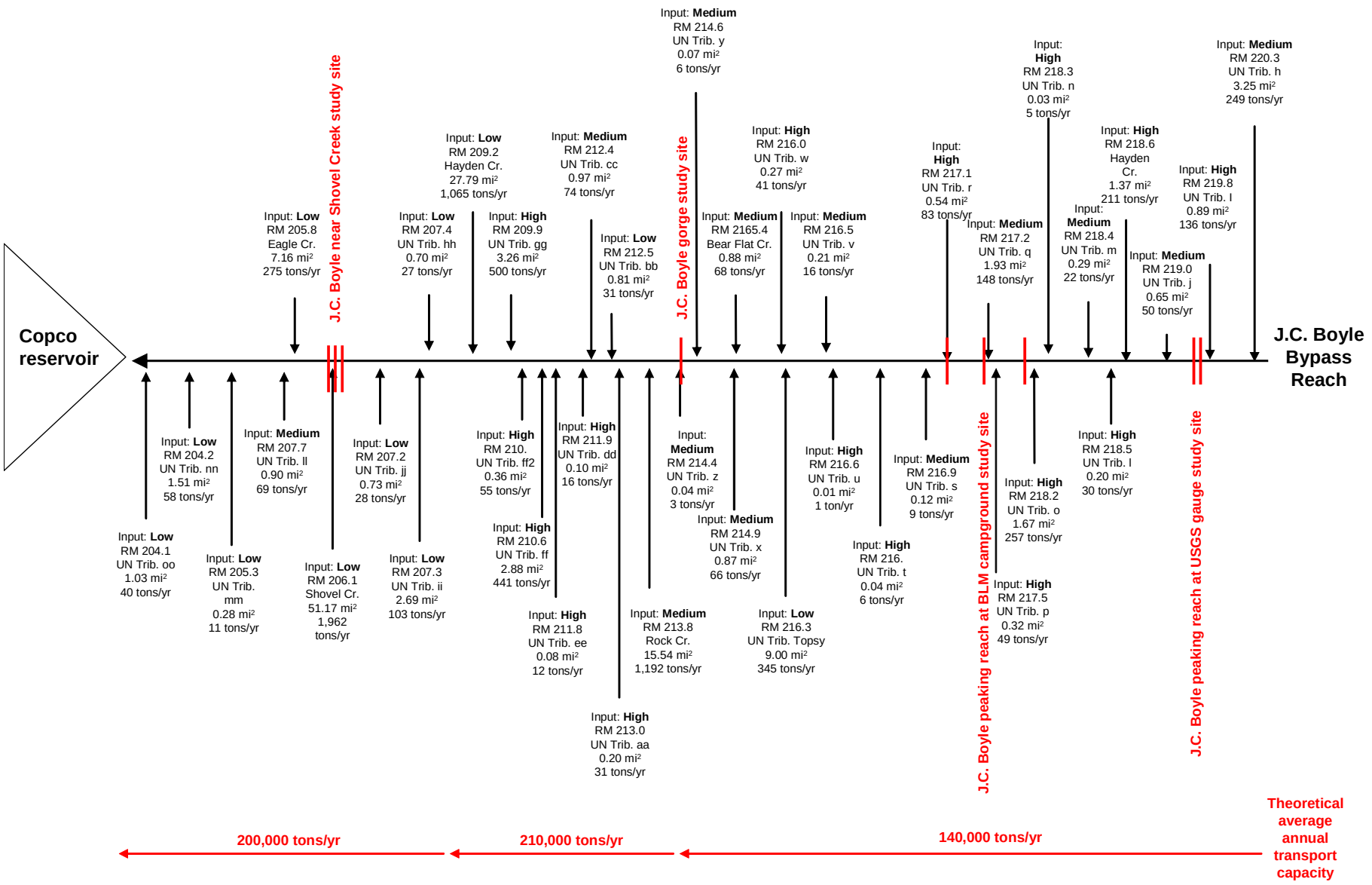

Figure 4. J.C Boyle Reach (Peaking Subreach) Sediment Budget Schematic (portion of revised Figure 6.7-61 from PacifiCorp 2004).

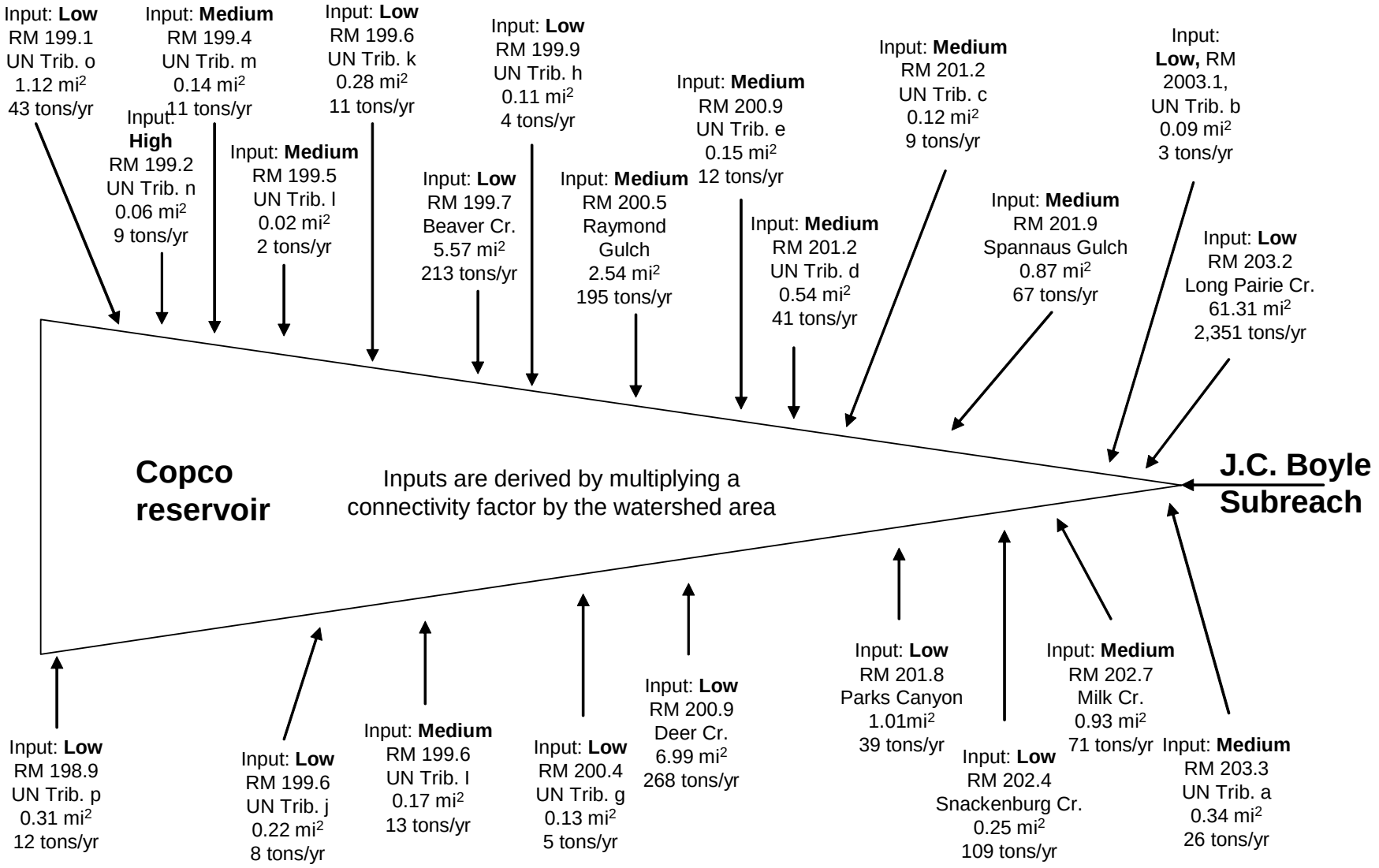

Figure 5. J.C Boyle Reach (Copco Subreach) Sediment Budget Schematic (portion of revised Figure 6.7-61 from PacifiCorp 2004).

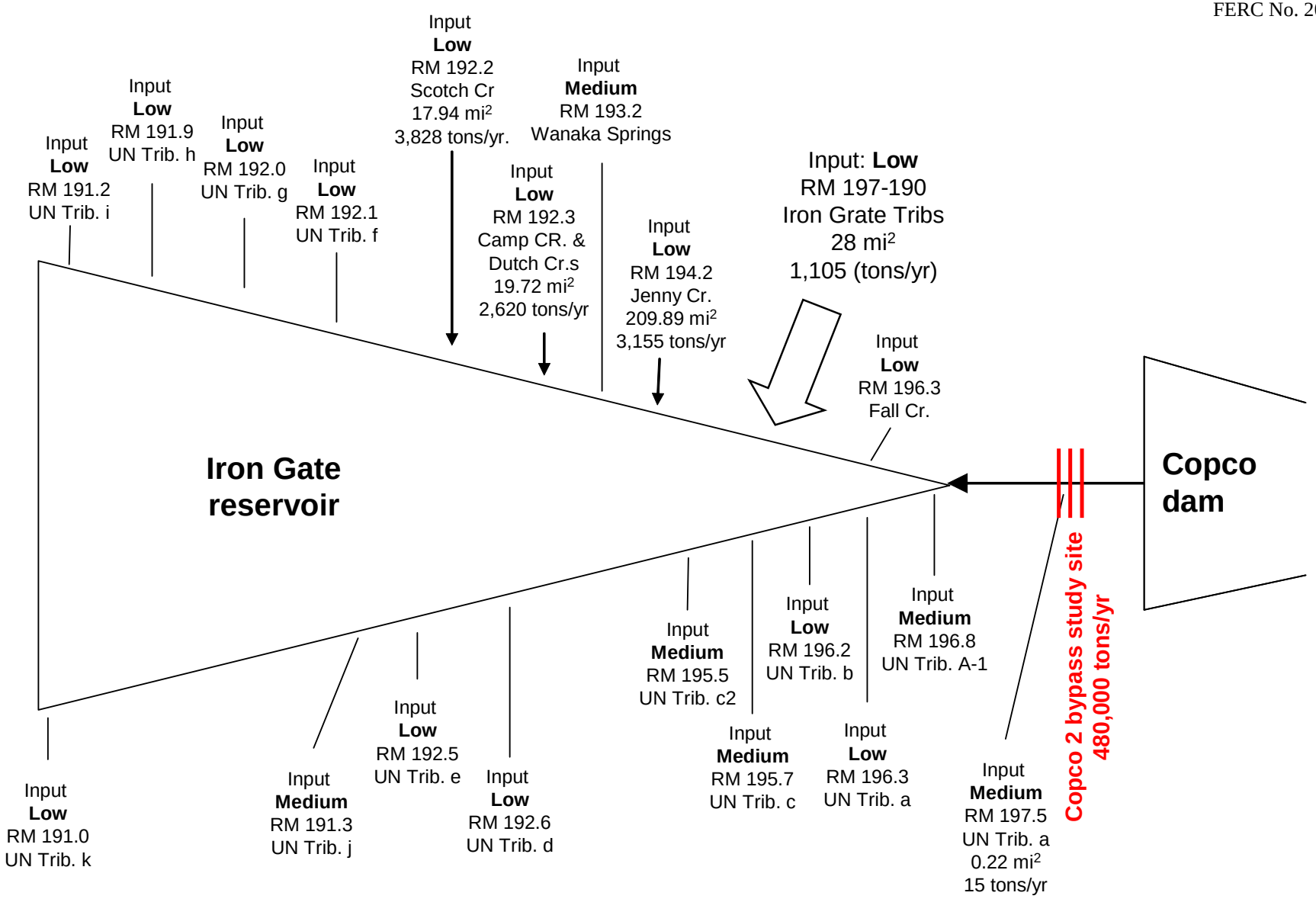

Figure 6. Copco-to-Iron Gate Reach Sediment Budget Schematic (portion of revised Figure 6.7-62 from PacifiCorp 2004). Input obtained by applying a connectivity rate to Scotch, Camp, Dutch, and Jenny creeks and Unnamed tributary a and the remaining watershed area of the Copco Reach.

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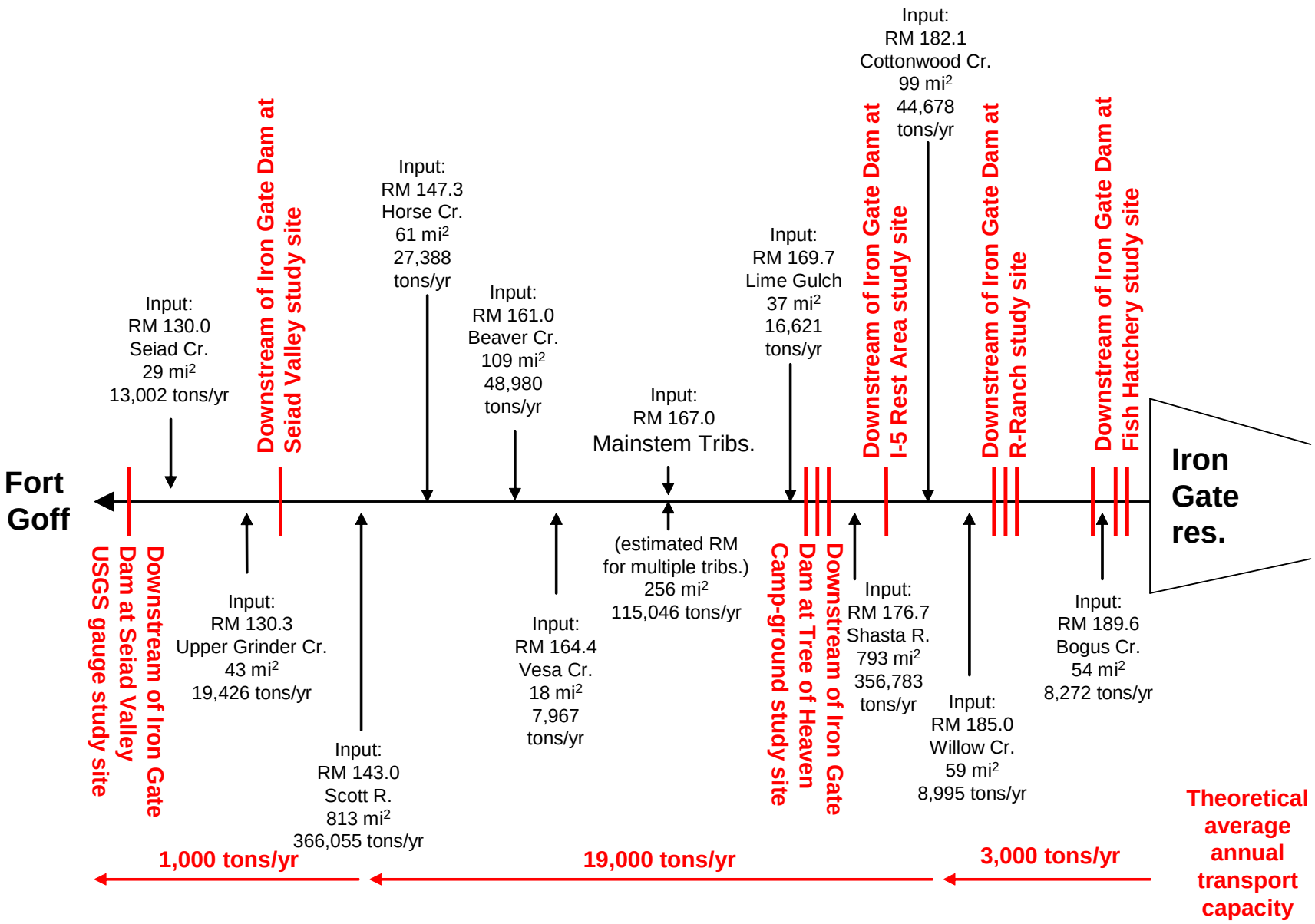

Figure 7. Downstream of Iron Gate Reach Sediment Budget Schematic (portion of revised Figure 6.7-63 from PacifiCorp 2004).

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4.2 Results

The sediment budget for the Klamath River was revised to improve the transparency of how the budget was created and provide the budget in a modifiable format. The following changes were made to the sediment budget:

- The most significant revision to the sediment budget is the cumulative summing of deficits or surpluses of sediment carried through reservoirs from the upstream reach to the downstream reach. This increases the calculated sediment deficit in the J.C. Boyle and Copco Project study reaches (Table 4).
- Additional descriptive notes were added to the master sediment budget spreadsheet (contained in the companion CD to this report) to clarify the methods used to estimate sediment inputs for each Project study reach (Table 3).
- To improve consistency between the between the Project Reaches, a master connectivity table was added to the bottom of the master sediment budget spreadsheet (contained in the companion CD to this report). The weighted values used to calculate the inputs were unchanged, but the labels assigned to each weight were made consistent throughout the table.
- The sediment load consistently refers to the bed material load and the bed load throughout the budget.

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Table 4. Summary of deficit and surplus by reach of the original and revised sediment budget.

Project Study Reach	Final Technical Report (PacifiCorp 2004) Potential Average Annual Deficit or Surplus (tons/yr)	Revised Sediment Budget Estimated Deficit or Surplus (tons/year)
Link	0	0
Keno	-6,134	-6,134
J.C. Boyle	-15,417	-21,551
Copco	-10,708	-32,274
Downstream of Iron Gate Dam	Surplus downstream of Cottonwood Creek	Surplus downstream of Cottonwood Creek

The results of the sediment budget modifications can be found in the master sediment budget spreadsheet (contained in the companion CD to this report), along with all formulas, data, and results in a modifiable format and total annual volume of sediment contributed by each source or tributary. Table 4 summarizes the primary differences in results generated with the modified sediment budget.

The sediment budget results for each Project study reach are discussed below. It should be noted that sediment deficit and surplus values presented in the Water Resources Final Technical Report (PacifiCorp 2004) were incorrectly referred to in units of cubic yards per year instead of tons per year. The values were correct in both the text and the tables of the Water Resources Final Technical Report, and therefore the error was limited to the terminology used in the results and did not impact the development of mitigation measures or other related analyses. This terminology error has been corrected in the following sections.

4.2.1 Link River Reach

As discussed in the Water Resources Final Technical Report (PacifiCorp 2004), the Link River reach is characterized in this sediment budget as a transport reach and, because of Upper Klamath Lake, probably had very low sediment supply prior to the completion of the Project. Few tributaries contribute sediment directly to this reach, and relatively steep slopes result in a high theoretical transport capacity (Figure 1).

Most of the tributaries to the Link River reach have very long depositional zones before joining the mainstem. For these tributaries, it was assumed that bed load material would be deposited before reaching the mainstem. Because of the long depositional zones of the tributaries in this reach, a low (nearly disconnected) connectivity factor (0.01) was applied to the total watershed area. The watershed area of the Link River reach was determined by the difference between the Link River Gauge and the Keno reservoir gauges. The low (nearly disconnected) connectivity factor was chosen based largely on professional judgment of the Geomorphology Subgroup (GSG).

The results of the sediment budget for the Link River reach and Keno reservoir indicate that Keno dam causes a potential deficit of approximately 250,000 tons per year of sediment that could be transported to the Keno reach if not for the dam. However, the actual potential deficit is determined by sediment inputs and amounts to only 169 tons per year, because historical transport could not have exceeded supply despite the high transport capacity of this reach. (Note: this and all of the following tributary input values have been adjusted to remove the 20 percent wash load included in the tributary volume results discussed in section 6.7.11 of the Water Resources Final Technical Report (PacifiCorp 2004)). Further, because this sediment would have historically been deposited in Lake Ewauna, there is probably not a significant impact on sediment transport in this reach or the Keno reach downstream. Therefore the cumulative deficit to the downstream reach is 0 tons/year.

4.2.2 Keno Reach

As discussed in the Water Resources Final Technical Report (PacifiCorp 2004), the Keno reach is also characterized as a transport reach that has a very high transport capacity and limited sediment input. As in the Link River reach, the Keno reach was also likely relatively sediment-starved before the Project because of the presence of the low gradient areas immediately upstream, including Lake Ewauna. Although more tributaries contribute sediment to this reach, theoretical transport capacity is much higher on average than the sediment inputs (Figure 2). The results of the sediment budget for the Keno reach and J.C. Boyle reservoir indicate that J.C. Boyle dam causes a potential deficit of approximately 900,000 tons per year of sediment that could be transported to the J.C. Boyle reach if not for the dam. However, as described above for the Link River, the actual potential deficit is again determined by sediment inputs in this reach

and amounts to 6,134 tons per year. Therefore, while this reach has the potential to carry an average of 900,000 tons of bed load material each year, the total input of 6,134 tons per year is estimated as the actual transport that occurred in this reach prior to the Project.

4.2.3 J.C. Boyle Reach

As discussed in the Water Resources Final Technical Report (PacifiCorp 2004), the J.C. Boyle reach has several more tributaries than the previous two reaches. However, this reach still has relatively high theoretical transport capacities that make it another supply-limited transport reach. The J.C. Boyle reach is divided into five subreaches to capture changes in channel morphology, Project facilities, and sediment inputs. In each subreach, the transport capacity is much greater than the sum of all sediment inputs to the reach (Figure 3 through 5). The results of the sediment budget for the J.C. Boyle reach and Copco reservoir indicate that Copco dam causes a potential deficit of approximately 810,000 tons per year of sediment that could be transported to the Copco reach if not for the dam. However, the actual potential deficit is once again determined by sediment inputs in this reach and amounts to 15,417 tons per year. Therefore the revised cumulative deficit to the Copco reach is 21,551 tons/year (6,134 tons per year from the Keno reach added to the 15,417 tons per year from the J.C. Boyle reach).

4.2.4 Copco-to-Iron Gate Reach

Although the transport capacity of the Copco-to-Iron Gate reach is approximately half that of the previous two reaches, the reach is still supply-limited and acts as a transport reach in the sediment budget (Figure 6). As discussed in the Water Resources Final Technical Report (PacifiCorp 2004), the results of the sediment budget for the Copco river reach and Iron Gate reservoir indicate that Iron Gate dam causes a potential deficit of approximately 480,000 tons per year of sediment that could be transported to the Copco-to-Iron Gate reach if not for the dam. However, the actual potential deficit is once again determined by sediment inputs in this reach and amounts to 10,723 tons per year. The revised cumulative deficit is 32,274 tons/year (21,551 tons per year from upstream added to the 10,723 tons per year for the Copco-to-Iron Gate reach).

4.2.5 Downstream of Iron Gate Dam

As discussed in the Water Resources Final Technical Report (PacifiCorp 2004), the reach downstream of Iron Gate dam is broken into three subreaches that differ in channel morphology and sediment input from well-developed tributaries. The theoretical sediment transport dynamics downstream of Iron Gate dam show two significant changes resulting in the transition from a supply-limited system to a potentially transport-limited system. First, the channel gradient decreases, which decreases the sediment transport capacity of the reaches. Second, the geologic terrain shifts from the relatively low yield Cascade volcanics upstream to the higher yield Klamath geology downstream. These tributaries generally produce higher sediment yields than upstream tributaries.

Although the sediment budget results indicate substantial average annual storage downstream of Cottonwood Creek (Figure 7), the geomorphic field investigations and historical aerial photograph analysis do not indicate any channel bed aggradation through these reaches. It is likely that the theoretical transport capacities for the study reaches downstream of Iron Gate dam were significantly underestimated because the dimensionless critical shear stress determined empirically for the J.C. Boyle reach was applied downstream of Iron Gate dam. This was done

because no tracer movement observations were made downstream of Iron Gate dam during the study period. However, more of the available stream energy would likely go into sediment transport in the lower reaches, where less energy would be expended in boundary friction than in the steep boulder- and bedrock-controlled reaches upstream. Thus, the actual sediment transport capacity is almost certainly greater than is implied by these model results. Moreover, there is no geomorphic field evidence of channel aggradation in this reach.

5. REFERENCES

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Appendix A

Listing of Aerial Photographs Obtained for Geomorphology Study - Klamath Hydroelectric Project (FERC No. 2082)

Listing of Aerial Photographs Obtained for Geomorphology Study - Klamath Hydroelectric Project (FERC No. 2082)

Reach	Folder ID	Photo Year	Photo Date	Photo Numbers	Coverage DS Limit (RM)	Coverage US Limit (RM)	Discharge (cfs)	Scale	Agency	B/W or Color	General Comments
Link	K1979a	1979	6/8	178-183 to 178-185	245	255.5	1220	1:40000?	USDA	B/W	
	L1988a	1988	7/21	1-1 to 1-8	253	255	920	2:2400?	Pacificorp	Color	
	L1994a	1994	7/8	26-1 to 26-5	234.5	238.0	1090	1:12000	Pacificorp	Color	
	L1994a	1994	7/8	27-1 to 27-7	237.0	239.0	1090	1:12000	Pacificorp	Color	
	L1994a	1994	7/8	28-1 to 28-4	238.5	242.0	1090	1:12000	Pacificorp	Color	
	L1994a	1994	7/8	29-1 to 29-7	242.0	247.5	1090	1:12000	Pacificorp	Color	
	L1994a	1994	7/8	30-1 to 30-5	246.0	249.0	1090	1:12000	Pacificorp	Color	
	L1994a	1994	7/8	31-1 to 31-3	248.0	250.0	1090	1:12000	Pacificorp	Color	
	L1994a	1994	7/8	32-1 to 32-7	249.0	255.0	1090	1:12000	Pacificorp	Color	
	L1994a	1994	7/8	33-1 to 33-5	250.0	253.0	1090	1:12000	Pacificorp	Color	
	L1994a	1994	7/8	34-1 to 34-4	253.0	255.5	1090	1:12000	Pacificorp	Color	
	L2000a	2000	7/28	12260-118 to 12260-119	248.5	256.0	1060	1:40000	?	B/W	
	L2000a	2000	7/28	12260-137 to 12260-139	236.0	246.0	1060	1:40000	?	B/W	

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Reach	Folder ID	Photo Year	Photo Date	Photo Numbers	Coverage DS Limit (RM)	Coverage US Limit (RM)	Discharge (cfs)	Scale	Agency	B/W or Color	General Comments
Keno	K1952	1952	7/15	9H-18 to 9H-23	234.0	236.0	1310	1:12000	BLM?	B/W	
	K1952	1952	8/10	19H-17 to 19H-19	230.5	234.0	1550	1:12000	BLM?	B/W	
	K1952	1952	7/15	10H-44 to 10H-49	228.0	230.0	1310	1:12000	BLM?	B/W	
	K1952	1952	7/15	10H-90 to 10H-95	225.5	229.0	1310	1:12000	BLM?	B/W	Shows some of pre-JCB Dam reservoir
	K1952	1952	7/15	9H-112 to 9H-114	230.5	234.0	1310	1:12000	BLM?	B/W	
	K1952	1952	7/15	9H-150 to 9H-156	229.5	232.0	1310	1:12000	BLM?	B/W	
	K1960a	1960	8/16	6AA-105 to 6AA-107	228.5	233.5	786	1:20000	?	B/W	Shows some of pre-Keno Dam
	K1960b	1960	8/17	7AA-42 to 7AA-44	230.5	236.0	802	1:20000	?	B/W	Good coverage of pre-Keno Dam
	K1960b	1960	8/1	2AA-52 to 2AA-55	235.0	240.0	?	1:20000	?	B/W	Lake Ewauna
	K1960b	1960	8/1	2AA-73 to 2AA-78	240.0	248.5	?	1:20000	?	B/W	Lake Ewauna
	K1960b	1960	8/2	2AA-163 to 2AA-165	247.0	249.0	?	1:20000	?	B/W	Lake Ewauna
	K1960b	1960	8/2	2AA-193 to 2AA-194	248.5	253.0	?	1:20000	?	B/W	Lake Ewauna
	K1968a	1968	5/5	1JJ-42 to 1JJ-43	225.0	230.0	290	1:24000	?	B/W	
	K1968a	1968	9/10	6JJ-19 to 6JJ-21	231	234	770	1:24000	?	B/W	
	K1968b	1968	5/5	1JJ-68 to 1JJ-71	232.0	237.5	290	1:24000	?	B/W	Upper Keno Reach
	K1968b	1968	5/5	1JJ-151 to 1JJ-155	235.5	242.0	322	1:24000	?	B/W	
	K1968b	1968	5/5	1JJ-170 to 1JJ-172	242.0	247.5	322	1:24000	?	B/W	
	K1968b	1968	5/5	1JJ-199 to 1JJ-201	246.5	249.5	322	1:24000	?	B/W	
	K1968b	1968	5/3	2JJ-182 to 2JJ-183	248.5	252.5	729	1:24000	?	B/W	
	K1968b	1968	6/21	5JJ-227 to 5JJ-232	240.5	247.0	980	1:24000	?	B/W	

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Reach	Folder ID	Photo Year	Photo Date	Photo Numbers	Coverage DS Limit (RM)	Coverage US Limit (RM)	Discharge (cfs)	Scale	Agency	B/W or Color	General Comments
Keno	K1979a	1979	6/8	178-195 to 178-198	236	248.5	1220	1:40000?	USDA	B/W	
	K1979a	1979	6/8	178-234 to 178-236	228	238	635	1:40000?	USDA	B/W	
	K1988a	1988	7/21	1-1 to 1-4	232.5	234	277	1:2400?	Pacificorp	Color	
	K1988a	1988	7/21	2-1 to 2-4	232.3	233.3	277	1:2400?	Pacificorp	Color	
	K1988a	1988	7/21	3-1 to 3-13	230	232.5	277	1:2400?	Pacificorp	Color	
	K1988a	1988	7/21	4-1 to 4-6	229.3	231	277	1:2400?	Pacificorp	Color	
	K1988a	1988	7/21	5-1 to 5-5	228.8	230	277	1:2400?	Pacificorp	Color	
	K1988a	1988	7/21	6-1 to 6-4	228.5	229.3	277	1:2400?	Pacificorp	Color	
	K1988a	1988	7/21	7-1 to 7-4	228.0	229.0	277	1:2400?	Pacificorp	Color	
	K1993a	1993	7/30	6217-136 to 6217-137	237.0	251.0	535	1:40000?	?	B/W	Lake Ewauna
	K1993a	1993	7/30	6217-167 to 6217-168	234.0	242.0	535	1:40000?	?	B/W	Lake Ewauna
	K1993a	1993	8/29	7191-184 to 7191-185	238.0	251.0	659	1:40000?	?	B/W	Lake Ewauna
	K1994a	1994	7/3	7182-63 to 7182-66	227.5	239.0	297	1:40000?	?	B/W	
	K1994a	1994	7/3	7183-13 to 7183-15	219.0	231.0	297	1:40000?	?	B/W	Contains some of JCB bypass reach
	K1994b	1994	7/9	24-1 to 24-9	226.5	232.0	342	1:12000	Pacificorp	Color	
	K1994b	1994	7/9	25-1 to 25-3	227.0	230.0	342	1:12000	Pacificorp	Color	
	K1994c	1994	7/9	23B-1 to 23B-6	230.8	236.0	342	1:12000	Pacificorp	Color	
	K2000a	2000	7/28	12260-207 to 12260-208	229.0	243.0	557	1:40000	?	B/W	
	K2000a	2000	8/5	12270-111 to 12270-112	227.5	236.0	501	1:40000	?	B/W	

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Reach	Folder ID	Photo Year	Photo Date	Photo Numbers	Coverage DS Limit (RM)	Coverage US Limit (RM)	Discharge (cfs)	Scale	Agency	B/W or Color	General Comments
Boyle	B1952a	1952	8/10	19H-56 to 19H-60	218.5	224.0	1550	1:15000?	BLM	B/W	Shows JCB reach before JCB dam
	B1952b	1952	8/10	19H-152 to 19H-160	214.7	221.0	1550	1:15000?	BLM	B/W	Shows JCB reach before JCB dam
	B1955a	1955	8/11	11P-3 to 11P-5	204.5	209.7	1430	1:24000	DDC?	B/W	Shows Keno reach
	B1955a	1955	8/9	10P-176 to 10P-178	202.0	206.5	1530	1:24000	DDC?	B/W	Shows Keno reach
	B1955a	1955	8/9	10P-167 to 10P-168	201.5	204.0	1530	1:24000	DDC?	B/W	Shows Keno reach
	B1957a	1957	8/20	23	222.0	224.8	1270	1:15000	BLM?	B/W	Poor quality copies
	B1957b	1957	8/12	22	219.5	222.0	1290	1:15000	BLM?	B/W	Poor quality copies
	B1957c	1957	8/20	20-21	212.5	216.0	1270	1:15000	BLM?	B/W	Poor quality copies
	B1957d	1957	8/3	16-19	211.0	212.5	1310	1:15000	BLM?	B/W	Poor quality copies
	B1963a	1963	8/26	88DD-64 to 8DD-65	202.0	205.5	1190	1:24000	DDC?	B/W	
	B1963a	1963	8/26	88DD-75 to 8DD-78	204.5	210.0	1190	1:24000	DDC?	B/W	Shovel Creek site
	B1965a	1965	7/9	3FF-133 to 3FF-134	202.5	206.5	648	1:24000	DDC?	B/W	
	B1965a	1965	7/9	3FF-143 to 3FF-145	204.5	210.5	648	1:24000	DDC?	B/W	Shovel Creek site
	B1965b	1965	7/9	3FF-168 to 3FF-169	200.0	204.0	648	1:24000	DDC?	B/W	
	B1965b	1965	7/9	3FF-246 to 3FF-248	198.3	202.3	648	1:24000	DDC?	B/W	
	B1965b	1965	7/9	3FF-257 to 3FF-258	195.5	199.5	648	1:24000	DDC?	B/W	
	K1968a	1968	5/3	2JJ-48 to 2JJ-52	219.0	228.0	1120	1:24000	?	B/W	
	B1968a	1968	6/21	5JJ-102 to 5JJ-104	211.0	216.0	779	1:24000	?	B/W	
	B1968a	1968	6/21	5JJ-166 to 5JJ-172	214.0	221.5	779	1:24000	?	B/W	
	B1971b	1971	6/29	5MM-75 to 5MM-76	207.0	212.5	1030	1:24000	DDC?	B/W	

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Reach	Folder ID	Photo Year	Photo Date	Photo Numbers	Coverage DS Limit (RM)	Coverage US Limit (RM)	Discharge (cfs)	Scale	Agency	B/W or Color	General Comments
Boyle	B1971b	1971	8/4	8MM-95 to 8MM-96	199.5	204.0	572	1:24000	DDC?	B/W	
	B1971b	1971	8/4	8MM-109 to 8MM-110	202.0	206.5	572	1:24000	DDC?	B/W	
	B1971b	1971	8/4	8MM-123 to 8MM-126	204.0	210.0	572	1:24000	DDC?	B/W	
	B1971c	1971	8/19	12-144 to 12-145	201.5	205.0	1330	1:24000	?	Color	
	B1971c	1971	8/19	12-205 to 12-207	203.5	207.7	1330	1:24000	?	Color	
	B1971c	1971	9/5	15-70 to 15-76	205.0	216.0	1270	1:24000	?	Color	
	B1971c	1971	9/5	15-123 to 15-124	210.0	213.5	1270	1:24000	?	Color	
	C1979a	1979	9/7	179-74 to 179-76	200.5	210.5	1020	1:40000?	USDA	B/W	
	B1980a	1980	8/7	980-95 to 980-96	200	204	?	1:14400?	USDA	Color	
	B1980a	1980	8/7	1080-5 to 1080-8	203	205	?	1:14400?	USDA	Color	
	B1980a	1980	8/7	1080-24 to 1080-26	203.5	206.5	?	1:14400?	USDA	Color	
	B1980a	1980	8/16	1780-124 to 1780-125	211.5	214.5	?	1:14400?	USDA	Color	
	B1980a	1980	8/16	1780-189 to 1780-194	209	214	?	1:14400?	USDA	Color	
	B1980a	1980	8/16	1880-14 to 1880-17	206.5	210.5	?	1:14400?	USDA	Color	
	B1980a	1980	8/16	1880-22 to 1880-25	204.5	209	?	1:14400?	USDA	Color	
	B1986a	1986	7/21	985-82	213	215.5	531	1:14400?	USDA	Color	
	B1986a	1986	7/21	985-164 to 95-165	211	214	531	1:14400?	USDA	Color	
	B1986a	1986	7/22	1185-27 to 1185-28	210.5	213.5	509	1:14400?	USDA	Color	
	B1986a	1986	7/22	1185-70 to 1185-76	206	211.5	509	1:14400?	USDA	Color	
	B1986a	1986	7/22	1185-100 to 1185-102	204.5	208	509	1:14400?	USDA	Color	
	B1986a	1986	7/22	1185-110 to 1185-113	203.5	206	509	1:14400?	USDA	Color	
	B1986a	1986	7/22	1185-130 to 1185-132	202	204.8	509	1:14400?	USDA	Color	
	B1986a	1986	7/22	1185-140 to 1185-141	201	203.5	509	1:14400?	USDA	Color	
	IGD1989a	1989	6/8	1292-82 to 1292-83	201	211	658	1:40000?	?	B/W	
	IGD1989a	1990	9/1	1305-38 to 1305-39	198	205.5	969	1:40000?	?	B/W	
	B1993a	1993	8/25	6254-37 to 6254-38	205.3	216.5	895	1:40000?	?	B/W	
	B1993a	1993	8/25	6254-89 to 6254-91	211	226	895	1:40000?	?	B/W	
	B1993a	1993	8/25	6254-263 to 6254-264	198	205	895	1:40000?	?	B/W	

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Boyle	B1993a	1993	8/25	6254-320 to 6254-321	201	211	895	1:40000?	?	B/W	
	B1994a	1994	7/7	7-13 to 7-27	198	207.5	496	1:12000	Pacificorp	Color	
	B1994a	1994	7/7	8-10 to 8-15	197.5	202	496	1:12000	Pacificorp	Color	
	B1994a	1994	7/7	10-1 to 10-3	n/a	n/a	n/a	1:12000	Pacificorp	Color	Beaver Creek delta
	B1994a	1994	7/8	11-1 to 11-5	201	203.5	497	1:12000	Pacificorp	Color	
	B1994a	1994	7/8	12-1 to 12-5	202	204.5	497	1:12000	Pacificorp	Color	
	B1994a	1994	7/8	13-1 to 13-4	203	205.5	497	1:12000	Pacificorp	Color	
	B1994a	1994	7/8	14-1 to 14-4	204.5	207	497	1:12000	Pacificorp	Color	
	B1994a	1994	7/8	15-1 to 15-6	205.5	209.5	497	1:12000	Pacificorp	Color	
	B1994a	1994	7/8	16-1 to 16-9	207	210.5	497	1:12000	Pacificorp	Color	
	B1994a	1994	7/8	17-1 to 17-9	209.5	212	497	1:12000	Pacificorp	Color	
	B1994a	1994	7/8	17-A1 to 17-A5	210.5	214	497	1:12000	Pacificorp	Color	
	B1994a	1994	7/8	18-1 to 18-7	209.5	215.3	497	1:12000	Pacificorp	Color	
	B1994a	1994	7/8	19-1 to 19-7	213.5	218	497	1:12000	Pacificorp	Color	
	B1994a	1994	7/8	20-1 to 20-8	215.7	221	497	1:12000	Pacificorp	Color	
	B1994a	1994	7/9	21-1 to 21-10	219.5	225	508	1:12000	Pacificorp	Color	
	B1994a	1994	7/9	22-1 to 22-5	221.5	224.5	508	1:12000	Pacificorp	Color	
	B1994b	1994	7/9	22-6 to 22-11	223	228	508	1:12000	Pacificorp	Color	Spencer Creek delta
	B1994b	1994	7/9	23A-1 to 23A-4	224.5	227	508	1:12000	Pacificorp	Color	
	B1999a	1999	9/25	199-95 to 199-98	210.3	215.5	1420	1:24000	USDA	Color	
	K2000a	2000	8/5	12270-128 to 12270-129	217	231	501	1:40000	?	B/W	
	K2000a	2000	8/13	12285-126 to 12285-127	211.5	226	502	1:40000	?	B/W	
	B2000a	2000	8/13	12285-71 to 12285-72	201	211	502	1:40000	?	B/W	
	B2000a	2000	8/13	12285-128	209	219	502	1:40000	?	B/W	
	B2000a	2000	8/13	12285-192 to 12285-193	207.7	216	502	1:40000	?	B/W	
	B2000a	2000	8/13	12285-201 to 12285-202	108	205.5	502	1:40000	?	B/W	
	B2000b	2000	8/14	1399-40 to 1399-46	202	210	830	1:24000	USDA	Color	
	B2000b	2000	8/14	1399-108 to 1399-110	203	206.5	830	1:24000	USDA	Color	

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Boyle	B2000c	2000	6/22	1-1-1 to 1-1-8	227.5	227.5	1120	1:2400	BLM	Color IR	Spencer Creek
	B2000c	2000	6/22	1-2-1 to 1-2-10	227.5	227.5	1120	1:2400	BLM	Color IR	Spencer Creek
	B2000d	2000	6/22	1-3-1 to 1-3-15	227.5	227.5	1120	1:2400	BLM	Color IR	Spencer Creek Nr Hayden
	B2000e	2000	6/22	2-1-1 to 2-1-9	208.5	209.5	1120	1:2400	BLM	Color IR	Creek mouth
	B2000e	2000	6/22	2-2-1 to 2-2-6	n/a	n/a	n/a	1:2400	BLM	Color IR	
	B2000e	2000	6/22	2-3-1 to 2-3-9	n/a	n/a	n/a	1:2400	BLM	Color IR	
	B2000e	2000	6/22	2-4-1 to 2-4-6	n/a	n/a	n/a	1:2400	BLM	Color IR	
	B2000f	2000	6/23	3-7-1 to 3-7-13	207.3	209.3	1110	1:2400	BLM	Color IR	
	B2000f	2000	6/23	3-8-1 to 3-8-8	208.5	209.5	1110	1:2400	BLM	Color IR	
	B2000f	2000	6/23	3-9-1 to 3-9-8	209.5	210.5	1110	1:2400	BLM	Color IR	
	B2000g	2000	6/23	3-10-1 to 3-10-8	210	211.7	1110	1:2400	BLM	Color IR	
	B2000g	2000	6/23	3-11-1 to 3-11-7	211	212	1110	1:2400	BLM	Color IR	
	B2000h	2000	6/23	3-12-1 to 3-12-7	211.5	213	1110	1:2400	BLM	Color IR	
	B2000h	2000	6/23	3-13-1 to 3-13-10	212.5	214.5	1110	1:2400	BLM	Color IR	
	B2000h	2000	6/23	3-14-1 to 3-14-8	214	215.5	1110	1:2400	BLM	Color IR	
	B2000i	2000	6/23	3-15-1 to 3-15-6	214.5	215.7	1110	1:2400	BLM	Color IR	
	B2000i	2000	6/23	3-16-1 to 3-16-6	215.5	216.5	1110	1:2400	BLM	Color IR	
	B2000j	2000	6/23	3-17-1 to 3-17-9	216	217.5	1110	1:2400	BLM	Color IR	
	B2000j	2000	6/23	3-18-1 to 3-18-6	217	217.8	1110	1:2400	BLM	Color IR	
	B2000j	2000	6/23	3-19-1 to 3-19-13	217.3	219	1110	1:2400	BLM	Color IR	
	B2000k	2000	6/23	3-20-1 to 3-20-10	218.5	219.8	1110	1:2400	BLM	Color IR	
	B2000k	2000	6/23	3-21-1 to 3-21-9	219.3	220.5	1110	1:2400	BLM	Color IR	
	B2000k	2000	6/23	3-22-1 to 3-22-9	220.3	221.5	1110	1:2400	BLM	Color IR	
	B2000l	2000	6/23	3-23-1 to 3-23-5	221	222	1110	1:2400	BLM	Color IR	
	B2000l	2000	6/23	3-24-1 to 3-24-13	221.5	223	1110	1:2400	BLM	Color IR	
	B2000m	2000	6/23	3-25-1 to 3-25-8	223	223.5	1110	1:2400	BLM	Color IR	
	B2000m	2000	6/23	3-26-1 to 3-26-10	223.5	224.5	1110	1:2400	BLM	Color IR	
	B2000n	2000	6/23	4-1-1 to 4-1-7	202.5	203.8	1110	1:2400	BLM	Color IR	

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Boyle	B2000n	2000	6/23	4-2-1 to 4-2-5	203.5	204.2	1110	1:2400	BLM	Color IR	
	B2000n	2000	6/23	4-3-1 to 4-3-13	204	205.5	1110	1:2400	BLM	Color IR	
	B2000o	2000	6/23	4-4-1 to 4-4-9	205.3	206.5	1110	1:2400	BLM	Color IR	
	B2000o	2000	6/23	4-5-1 to 4-5-5	206	207	1110	1:2400	BLM	Color IR	
	B2000o	2000	6/23	4-6-1 to 4-6-11	206.7	208	1110	1:2400	BLM	Color IR	
Copco	C1955a	1955	8/2	5P-212 to 5P-213	194.5	198.8	1320	1:24000	DDC?	B/W	Shows pre-IGD Copco reach
	C1955a	1955	8/2	6P-103 to 6P-104	196.0	200.5	1320	1:24000	DDC?	B/W	
	C1955a	1955	8/9	10P-62 to 10P-64	198.5	202.5	1530	1:24000	DDC?	B/W	
	IGD1964a	1964	10/21	20DD-186 to 20DD-187	194.5	198.7	?	1:24000	DDC?	B/W	Copco reach
	C1964a	1964	10/21	20DD-203 to 20DD-205	197.5	201.0	?	1:24000	DDC?	B/W	
	C1964a	1964	10/21	21DD-216 to 21DD-218	199.7	204.0	?	1:24000	DDC?	B/W	
	C1971a	1971	5/11	2MM-68 to 2MM-69	192.2	196.0	?	1:24000	DDC?	B/W	
	C1971a	1971	5/23	4MM-121 to 4MM-123	197.0	201.0	?	1:24000	DDC?	B/W	
	C1971a	1971	6/29	5MM-109 to 5MM-110	194.5	198.5	?	1:24000	DDC?	B/W	
	C1979a	1979	9/7	179-125 to 179-126	196	204	?	1:40000?	USDA	B/W	
	C1979a	1979	9/7	179-251 to 179-252	189.5	199	?	1:40000?	USDA	B/W	
	IGD1989a	1989	6/2	1291-199 to 1291-200	194.0	201.0	?	1:40000?	?	B/W	
	IGD1993a	1993	8/1	6254-273 to 6254-277	189.0	202.0	?	1:40000?	?	B/W	
	C1994a	1994	7/7	5-3 to 5-8	189.0	193.5	?	1:12000	Pacificorp	Color	
	C1994a	1994	7/7	6-1 to 6-2	190.5	192.5	?	1:12000	Pacificorp	Color	
	C1994a	1994	7/7	7-1 to 7-12	192.0	199.0	?	1:12000	Pacificorp	Color	
	C1994a	1994	7/7	8-1 to 8-9	192.0	199.0	?	1:12000	Pacificorp	Color	Camp, Jenny Cr. deltas
	C1994a	1994	7/7	9A-1 to 9A-6	n/a	n/a	n/a	1:12000	Pacificorp	Color	
	C1994a	1994	7/7	9A-1 to 9A-6	n/a	n/a	n/a	1:12000	Pacificorp	Color	Fall Creek delta
	C2000a	2000	8/13	12285-219 to 12285-220	194.0	201.5	?	1:40000?	?	B/W	

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Reach	Folder ID	Photo Year	Photo Date	Photo Numbers	Coverage DS Limit (RM)	Coverage US Limit (RM)	Discharge (cfs)	Scale	Agency	B/W or Color	General Comments
DS IGD	IGD1944a	1944	8/15	32-57 to 32-58	130.0	135.0	1110	1:24000	DOD	B/W	Seiad Creek confluence
	IGD1944a	1944	8/13	27-56 to 27-58	136.0	140.5	488	1:24000	DOD	B/W	
	IGD1944a	1944	8/12	22-16 to 22-17	138.0	143.0	1540	1:24000	DOD	B/W	
	IGD1944a	1944	8/12	21-76 to 21-77	141.5	146.0	1540	1:24000	DOD	B/W	Scott River confluence
	IGD1944a	1944	8/10	15-47 to 15-49	148.0	152.7	1370	1:24000	DOD	B/W	
	IGD1944b	1944	8/10	15-20 to 15-21	152.0	155.5	1370	1:24000	DOD	B/W	
	IGD1944a	1944	8/7	9-34 to 9-35	165.7	169.5	297	1:24000	DOD	B/W	
	IGD1944a	1944	8/10	10-22 to 10-24	168.5	173.0	1370	1:24000	DOD	B/W	Humbug Cr. mouth
	IGD1944a	1944	8/5	4-15 to 4-16	171.0	175.0	940	1:24000	DOD	B/W	
	IGD1944a	1944	8/4	3-15 to 3-16	175.0	179.0	1280	1:24000	DOD	B/W	Shasta R. confluence
	IGD1944a	1944	8/4	2-85 to 2-88	177.0	181.5	1280	1:24000	DOD	B/W	
	IGD1944b	1944	8/4	1-10 to 1-12	180.0	184.5	1280	1:24000	DOD	B/W	
	IGD1944b	1944	8/29	53-81 to 53-82	?	?	887	1:24000	DOD	B/W	
	IGD1944b	1944	9/6	72-32 to 72-34	?	?	1240	1:24000	DOD	B/W	
	IGD1955a	1955	8/2	6P-4 to 6P-5	192.5	196.5	1320	1:24000	DDC?	B/W	Shows upstream end of pre-IGD reservoir reach
	IGD1955a	1955	8/9	10P-48 to 10P-50	183.5	187.0	1530	1:24000	DDC?	B/W	
	IGD1955a	1955	8/9	9P-160 to 9P-164	185.0	191.0	1530	1:24000	DDC?	B/W	Shows some of pre-IGD reservoir reach
	IGD1955a	1955	8/9	9P-149 to 9P-150	189.5	194.0	1530	1:24000	DDC?	B/W	Shows downstream end of pre-IGD reservoir reach

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DS IGD	IGD1955b	1955	8/11	11P-115 to 11P-116	179	184.5	1430	1:24000	DDC?	B/W	
	IGD1955b	1955	8/11	11P-137 to 11P-139	176.6	183	1430	1:24000	DDC?	B/W	
	IGD1955b	1955	8/11	11P-206 to 11P-208	174.5	179.5	1430	1:24000	DDC?	B/W	
	IGD1955b	1955	8/11	12P-15 to 12P-16	171.7	176.5	1430	1:24000	DDC?	B/W	
	IGD1955c	1955	8/12	12P-204 to 12P-206	164.0	169.5	1540	1:24000	DDC?	B/W	
	IGD1955c	1955	8/12	12P-127 to 12P-129	166.5	172.5	1540	1:24000	DDC?	B/W	
	IGD1955c	1955	8/11	12P-94 to 12P-95	169.0	175.0	1430	1:24000	DDC?	B/W	
	IGD1955d	1955	8/12	13P-117 to 13P-118	156.5	162.5	1540	1:24000	DDC?	B/W	
	IGD1955d	1955	8/12	13P-93 to 13P-95	159.5	164.5	1540	1:24000	DDC?	B/W	
	IGD1955d	1955	8/12	13P-12 to 13P-13	162.5	167.0	1540	1:24000	DDC?	B/W	
	IGD1955e	1955	8/12	8P-3 to 8P-4	152.5	157.0	1540	1:24000	DDC?	B/W	
	IGD1955e	1955	8/12	8P-98 to 8P-99	149.8	154.5	1540	1:24000	DDC?	B/W	
	IGD1955e	1955	8/12	13P-196 to 13P-198	154.5	160.0	1540	1:24000	DDC?	B/W	
	IGD1955e	1955	8/17	14P-47 to 14P-48	148.4	153.2	817	1:24000	DDC?	B/W	
	IGD1955f	1955	8/4	6P-121 to 6P-122	144.3	151.0	1280	1:24000	DDC?	B/W	
	IGD1955f	1955	8/17	6P-154 to 6P-155	142.0	149.0	817	1:24000	DDC?	B/W	
	IGD1955f	1955	8/17	6P-183 to 6P-186	140.0	147.0	817	1:24000	DDC?	B/W	
	IGD1963a	1963	8/14	3DD-72 to 3DD-75	140	147	1060	1:24000	DDC?	B/W	
	IGD1963a	1963	8/14	3DD-127 to 3DD-129	143.5	149.5	1060	1:24000	DDC?	B/W	
	IGD1963a	1963	8/14	3DD-153 to 3DD-155	147.5	152.0	1060	1:24000	DDC?	B/W	
	IGD1963b	1963	8/16	5DD-44 to 5DD-45	147.0	154.5	1080	1:24000	DDC?	B/W	
	IGD1963b	1963	8/16	5DD-55 to 5DD-56	152.5	156.5	1080	1:24000	DDC?	B/W	
	IGD1963b	1963	9/3	10DD-99 to 10DD-101	154.0	159.5	1360	1:24000	DDC?	B/W	
	IGD1963c	1963	8/27	7DD-41 to 7DD-43	165.5	171.0	1030	1:24000	DDC?	B/W	
	IGD1963c	1963	8/27	7DD-147 to 7DD-148	182.0	186.0	1030	1:24000	DDC?	B/W	
	IGD1963c	1963	8/28	9DD-39 to 9DD-41	168.0	174.0	1040	1:24000	DDC?	B/W	
	IGD1963c	1963	8/28	9DD-67 to 9DD-71	175.0	180.0	1040	1:24000	DDC?	B/W	Shasta River confluence

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DS IGD	IGD1963c	1963	8/28	9DD-203 to 9DD-206	181.5	193.5	1040	1:24000	DDC?	B/W	IGD reach just after completion of the dam
	IGD1963c	1963	8/29	10DD-61 to 10DD-62	171.5	176.0	1050	1:24000	DDC?	B/W	
	IGD1964a	1964	10/21	20DD-73 to 20DD-75	187.0	193.0	1770	1:24000	DDC?	B/W	
	IGD1964a	1964	10/21	20DD-79 to 20DD-81	192.0	196.5	1770	1:24000	DDC?	B/W	
	IGD1964b	1964	10/21	21DD-23 to 21DD-26	177.5	183.0	1770	1:24000	DDC?	B/W	
	IGD1964b	1964	10/22	21DD-198 to 21DD-200	184.0	189.3	1770	1:24000	DDC?	B/W	
	IGD1964c	1964	10/21	19DD-134 to 19DD-136	156.5	162.5	1770	1:24000	DDC?	B/W	
	IGD1964c	1964	10/21	19DD-146 to 19DD-147	161.0	165.0	1770	1:24000	DDC?	B/W	
	IGD1964c	1964	10/21	19DD-238 to 19DD-239	163.0	167.0	1770	1:24000	DDC?	B/W	
	IGD1964d	1964	8/11	9-172 to 9-174	157.5	162.0	1030	1:24000	ENU?	B/W	
	IGD1964d	1964	8/11	9-131 to 9-132	155.0	159.0	1030	1:24000	ENU?	B/W	
	IGD1964d	1964	8/11	9-188 to 9-190	153.5	156.5	1030	1:24000	ENU?	B/W	
	IGD1964d	1964	8/11	9-237 to 9-238	145.0	149.3	1030	1:24000	ENU?	B/W	
	IGD1964d	1964	8/17	14-90 to 14-94	142.0	148.0	1060	1:24000	ENU?	B/W	
	IGD1964d	1964	8/19	14-198 to 14-199	148.0	152.0	1070	1:24000	ENU?	B/W	
	IGD1964d	1964	8/19	14-211 to 14-212	150.5	153.5	1070	1:24000	ENU?	B/W	
	IGD 1964e	1964	8/8	7-106 to 7-108	175.0	179.0	1080	1:24000	ENU?	B/W	Copies
	IGD 1964e	1964	8/8	7-113 to 7-114	171.0	175.5	1080	1:24000	ENU?	B/W	Copies
	IGD 1964e	1964	8/8	7-188	170.5	175.5	1080	1:24000	ENU?	B/W	Copies
	IGD 1964e	1964	8/21	16-219-16-221	129.5	133.5	1070	1:24000	ENU?	B/W	Copies
	IGD1964f	1964	8/8	7-106 to 7-108	175.5	179.0	1080	1:24000	ENU?	B/W	
	IGD1964f	1964	8/8	7-132 to 7-133	173.5	177.5	1080	1:24000	ENU?	B/W	
	IGD1964f	1964	8/8	7-188 to 7-189	171.5	175.5	1080	1:24000	ENU?	B/W	
	IGD1964f	1964	8/8	7-219 to 7-220	167.6	173.5	1080	1:24000	ENU?	B/W	
	IGD1964f	1964	8/10	8-198 to 8-199	166.0	171.0	1060	1:24000	ENU?	B/W	
	IGD1964f	1964	8/10	9-36 to 9-37	161.0	165.0	1060	1:24000	ENU?	B/W	
	IGD1964f	1964	8/16	13-257 to 13-258	162.5	166.3	1060	1:24000	ENU?	B/W	
	IGD1964f	1964	8/16	13-278 to 13-280	167.5	173.0	1060	1:24000	ENU?	B/W	

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DS IGD	IGD1964f	1964	8/29	22-272 to 22-274	164.0	168.0	1070	1:24000	ENU?	B/W	
	IGD1964g	1964	8/17	14-117 to 14-118	127.0	131.0	1060	1:24000	ENU?	B/W	
	IGD1964g	1964	8/23	18-69 to 18-71	131.0	135.0	1060	1:24000	ENU?	B/W	
	IGD1964g	1964	8/23	18-96 to 18-98	135.0	139.0	1060	1:24000	ENU?	B/W	
	IGD1964g	1964	8/23	18-144 to 18-145	140.0	144.5	1060	1:24000	ENU?	B/W	
	IGD1964g	1964	8/26	20-18 to 20-19	133.0	137.5	1060	1:24000	ENU?	B/W	
	IGD1964g	1964	9/6	25-94 to 25-96	137.5	142.0	1370	1:24000	ENU?	B/W	
	IGD1965a	1965	7/10	4FF-70 to 4FF-72	193	197	743	1:24000	DDC?	B/W	
	IGD1965a	1965	7/10	4FF-82 to 4FF-85	188.0	194.5	743	1:24000	DDC?	B/W	
	IGD1965a	1965	7/10	4FF-155 to 4FF-159	184.5	192.0	743	1:24000	DDC?	B/W	
	IGD1965b	1965	7/10	4FF-175 to 4FF-176	182.0	186.5	743	1:24000	DDC?	B/W	
	IGD1965b	1965	7/10	4FF-230 to 4FF-231	179.0	183.5	743	1:24000	DDC?	B/W	
	IGD1965b	1965	7/10	4FF-250 to 4FF-254	175.5	181.5	743	1:24000	DDC?	B/W	
	IGD1965c	1965	7/19	11FF-41 to 11FF-42	173.0	177.0	846	1:24000	DDC?	B/W	
	IGD1965c	1965	7/19	11FF-143 to 11FF-144	170.5	175.0	846	1:24000	DDC?	B/W	
	IGD1965c	1965	7/19	11FF-176 to 11FF-179	166.5	171.5	846	1:24000	DDC?	B/W	
	IGD1965d	1965	7/10	5FF-52 to 5FF-55	155.0	161.0	743	1:24000	DDC?	B/W	
	IGD1965d	1965	7/10	5FF-128 to 5FF-130	153.0	156.5	743	1:24000	DDC?	B/W	
	IGD1965d	1965	7/10	5FF-137 to 5FF-138	150.4	154.0	743	1:24000	DDC?	B/W	
	IGD1965e	1965	7/10	5FF-37 to 5FF-38	157.5	162.0	743	1:24000	DDC?	B/W	
	IGD1965e	1965	7/29	14FF-177 to 14FF-179	164.0	169.0	694	1:24000	DDC?	B/W	
	IGD1965e	1965	7/29	14FF-217 to 14FF-219	162.0	165.7	694	1:24000	DDC?	B/W	
	IGD1965f	1965	7/29	15FF-17 to 15FF-19	147.0	152.0	694	1:24000	DDC?	B/W	
	IGD1965f	1965	8/14	16FF-47 to 16FF-48	145.5	149.5	1020	1:24000	DDC?	B/W	
	IGD1965f	1965	8/14	16FF-141 to 16FF-146	140.0	147.0	1020	1:24000	DDC?	B/W	
	IGD1971a	1971	5/11	1MM-11 to 1MM-12	178.5	183.0	6660	1:24000	DDC?	B/W	
	IGD1971a	1971	5/11	1MM-66	175.0	179.5	6660	1:24000	DDC?	B/W	
	IGD1971a	1971	5/11	1MM-96	171.5	176.5	6660	1:24000	DDC?	B/W	

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DS IGD	IGD1971a	1971	5/11	1MM-145 to 1MM-146	182.0	185.5	6660	1:24000	DDC?	B/W	
	IGD1971a	1971	5/11	1MM-167 to 1MM-169	184.0	189.0	6660	1:24000	DDC?	B/W	
	IGD1971a	1971	5/11	1MM-82 to 1MM-87	188.0	193.5	6660	1:24000	DDC?	B/W	
	IGD1971b	1971	5/11	1MM-64 to 1MM-67	175	180	6660	1:24000	DDC?	B/W	
	IGD1971c	1971	5/11	1MM-95	171.5	176.5	6660	1:24000	DDC?	B/W	
	IGD1971c	1971	8/5	4MM-208 to 4MM-210	165.7	171	1000	1:24000	DDC?	B/W	
	IGD1971c	1971	8/5	4MM-240 to 4MM-242	168.5	175.0	1000	1:24000	DDC?	B/W	
	IGD1971d	1971	8/12	2-55 to 2-56	155.0	160.0	1020	1:24000	?	Color	
	IGD1971d	1971	8/12	2-85 to 2-87	147.5	152.0	1020	1:24000	?	Color	
	IGD1971d	1971	8/12	2-98 to 2-100	144.5	149.5	1020	1:24000	?	Color	
	IGD1971d	1971	8/12	2-120 to 2-125	142.0	148.0	1020	1:24000	?	Color	
	IGD1971d	1971	8/18	10-138 to 10-139	150.8	155.2	1020	1:24000	?	Color	
	IGD1971d	1971	8/18	10-153 to 10-154	153.5	157.0	1020	1:24000	?	Color	
	IGD1971d	1971	8/18	10-187 to 10-189	149.7	153.5	1020	1:24000	?	Color	
	IGD1971e	1971	8/12	2-186 to 2-188	133.5	137.5	1020	1:24000	?	Color	
	IGD1971e	1971	8/17	8-72 to 8-74	139.0	144.0	1020	1:24000	?	Color	
	IGD1971e	1971	8/17	8-133 to 8-134	135.0	140.0	1020	1:24000	?	Color	
	IGD1971e	1971	8/17	8-157 to 8-158	131.0	135.0	1020	1:24000	?	Color	
	IGD1971f	1971	8/12	2-139 to 2-141	126.0	131.0	1020	1:24000	?	Color	
	IGD1971f	1971	8/12	2-166 to 2-167	128.0	133.0	1020	1:24000	?	Color	
	IGD1971f	1971	8/14	5-36 to 5-38	125.0	130.0	1020	1:24000	?	Color	
	IGD1971g	1971	8/12	1-11 to 1-13	170.5	175.0	1020	1:20000?	?	Color	
	IGD1971g	1971	8/12	1-34 to 1-36	173.0	176.5	1020	1:20000?	?	Color	
	IGD1971g	1971	8/12	1-41	177.5	179.5	1020	1:20000?	?	Color	
	IGD1971g	1971	8/12	1-75 to 1-77	168.5	173.0	1020	1:20000?	?	Color	
	IGD1971g	1971	8/12	1-117 to 1-119	166.2	170.5	1020	1:20000?	?	Color	
	IGD1971g	1971	8/12	2-30 to 2-32	160.0	164.0	1020	1:20000?	?	Color	
	IGD1971g	1971	8/18	11-51 to 11-54	157.0	162.5	1020	1:20000?	?	Color	

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DS IGD	IGD1971g	1971	8/18	11-77	162.0	165.5	1020	1:20000?	?	Color	
	IGD1979a	1979	9/27	279-166 to 279-169	171.0	181.5	1310	1:40000?	USDA	B/W	
	IGD1979a	1979	9/27	279-198 to 279-199	177.0	186.5	1310	1:40000?	USDA	B/W	
	IGD1979a	1979	9/27	279-207 to 279-210	184.0	194.0	1310	1:40000?	USDA	B/W	
	IGD1979b	1979	9/27	279-61 to 279-63	165.5	175.5	1310	1:40000?	USDA	B/W	
	IGD1979b	1979	9/27	279-107 to 279-109	154.0	164.0	1310	1:40000?	USDA	B/W	
	IGD1979b	1979	9/27	279-155 to 279-156	160.0	168.5	1310	1:40000?	USDA	B/W	
	IGD1979c	1979	9/27	279-47 to 279-49	137.5	147.5	1310	1:40000?	USDA	B/W	
	IGD1979c	1979	9/27	279-56 to 279-58	141.5	151.5	1310	1:40000?	USDA	B/W	
	IGD1979c	1979	9/27	279-100 to 279-101	149.0	157.0	1310	1:40000?	USDA	B/W	
	IGD1980a	1980	8/17	2080-175 to 2080-179	156.7	161.5	1050	1:14400?	USDA	Color	
	IGD1980a	1980	8/18	2180-91 to 2180-93	173.0	175.7	1050	1:14400?	USDA	Color	
	IGD1980a	1980	8/18	2180-143 to 2180-144	171.0	175.0	1050	1:14400?	USDA	Color	
	IGD1980a	1980	8/18	2280-40 to 2280-41	162.5	165.0	1050	1:14400?	USDA	Color	
	IGD1980a	1980	8/18	2280-62 to 2280-64	163.0	166.5	1050	1:14400?	USDA	Color	
	IGD1980a	1980	8/18	2280-151 to 2280-153	159.5	162.5	1050	1:14400?	USDA	Color	
	IGD1980a	1980	8/19	2380-39 to 2380-40	166.3	170.5	1050	1:14400?	USDA	Color	
	IGD1980a	1980	8/19	2380-91 to 2380-92	165.0	167.7	1050	1:14400?	USDA	Color	
	IGD1980a	1980	8/19	2380-171 to 2380-173	167.5	171.0	1050	1:14400?	USDA	Color	
	IGD1980a	1980	8/19	24-30 to 24-32	161.0	164.0	1050	1:14400?	USDA	Color	
	IGD1980a	1980	9/23	2580-35 to 2580-38	169.5	173.5	1050	1:14400?	USDA	Color	
	IGD1980b	1980	8/14	1180-60 to 1180-62	150.5	153.0	1050	1:14400?	USDA	Color	
	IGD1980b	1980	8/14	1180-72 to 1180-73	148.0	151.5	1050	1:14400?	USDA	Color	
	IGD1980b	1980	8/14	1180-142 to 1180-145	147.0	150.0	1050	1:14400?	USDA	Color	
	IGD1980b	1980	8/14	1180-155 to 1180-157	145.0	149.0	1050	1:14400?	USDA	Color	
	IGD1980b	1980	8/14	1280-19 to 1280-21	141.0	146.0	1050	1:14400?	USDA	Color	
	IGD1980b	1980	8/14	1280-58 to 1280-63	142.0	147.5	1050	1:14400?	USDA	Color	
	IGD1980b	1980	8/17	1980-142 to 1980-144	153.0	155.8	1050	1:14400?	USDA	Color	

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Reach	Folder ID	Photo Year	Photo Date	Photo Numbers	Coverage DS Limit (RM)	Coverage US Limit (RM)	Discharge (cfs)	Scale	Agency	B/W or Color	General Comments
DS IGD	IGD1980b	1980	8/17	1980-176 to 1980-178	n/a	n/a	n/a	n/a	n/a	n/a	Tributary after flood
	IGD1980b	1980	8/17	2080-41 to 2080-43	154.3	157.0	1050	1:14400?	USDA	Color	
	IGD1980b	1980	8/17	2080-89 to 2080-94	155.5	159.5	1050	1:14400?	USDA	Color	
	IGD1980c	1980	8/14	1280-135 to 1280-138	133.5	136.5	1050	1:14400?	USDA	Color	
	IGD1980c	1980	8/14	1280-164 to 1280-165	132.0	135.0	1050	1:14400?	USDA	Color	
	IGD1980c	1980	8/14	1380-51 to 1380-53	128.0	131.0	1050	1:14400?	USDA	Color	
	IGD1980c	1980	8/14	1380-87 to 1380-90	126.0	130.0	1050	1:14400?	USDA	Color	
	IGD1980c	1980	8/16	1880-55 to 1880-61	134.5	138.0	1050	1:14400?	USDA	Color	
	IGD1980c	1980	8/16	1880-86 to 1880-89	136.0	140.0	1050	1:14400?	USDA	Color	
	IGD1980c	1980	8/16	1880-116 to 1880-122	138.0	141.0	1050	1:14400?	USDA	Color	
	IGD1988a	1988	7/21	1-1 to 1-10	188.7	190.3	551	1:2400?	Pacificorp	Color	
	IGD1988a	1988	7/21	2-1 to 2-7	188.3	189.3	551	1:2400?	Pacificorp	Color	
	IGD 1989a	1989	6/2	1291-147 to 1291-148	182.0	193.0	2050	1:40000?	?	B/W	
	IGD 1989a	1989	6/2	1291-186 to 1291-188	187.0	198.0	2050	1:40000?	?	B/W	
	IGD 1989b	1989	6/2	1291-103 to 1291-105	171.7	183.0	2050	1:40000?	?	B/W	
	IGD 1989b	1989	6/2	1291-130 to 1291-131	177.0	186.0	2050	1:40000?	?	B/W	
	IGD 1989b	1989	6/21	1294-32 to 1294-33	167.0	177.0	740	1:40000?	?	B/W	
	IGD 1989c	1989	8/16	1280-80 to 1280-81	153.0	163.0	1030	1:40000?	?	B/W	
	IGD 1989c	1989	8/16	1280-101 to 1280-102	149.0	158.0	1030	1:40000?	?	B/W	
	IGD 1989c	1989	6/21	1293-40 to 1293-41	157.0	168.0	740	1:40000?	?	B/W	
	IGD 1989c	1989	6/21	1293-60 to 1293-61	163.0	173.0	740	1:40000?	?	B/W	
	IGD 1989c	1989	6/25	1299-79 to 1299-80	143.0	154.0	739	1:40000?	?	B/W	
	IGD 1989c	1989	7/26	1304-89 to 1304-90	137.5	150.0	751	1:40000?	?	B/W	
	IGD1993a	1993	6/13	6249-58 to 6249-59	183.0	191.0	1730	1:40000?	?	B/W	
	IGD1993b	1993	6/13	6249-15 to 6249-16	173.0	181.5	1730	1:40000?	?	B/W	
	IGD1993c	1993	8/26	6255-76 to 6255-78	167	177	1040	1:40000?	?	B/W	
	IGD1993c	1993	8/26	6255-96 to 6255-97	163.0	173.0	1040	1:40000?	?	B/W	
	IGD1993c	1993	8/26	6256-39 to 6256-40	158.0	167.0	1040	1:40000?	?	B/W	

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DS IGD	IGD1993d	1993	8/26	6255-278 to 6255-279	149.8	158.0	1040	1:40000?	?	B/W	
	IGD1993d	1993	8/26	6256-57 to 6256-58	153.0	164.0	1040	1:40000?	?	B/W	
	IGD1993d	1993	8/26	6256-96 to 6256-97	143.0	154.0	1040	1:40000?	?	B/W	
	IGD1994a	1994	7/25	6259-21 to 6259-22	178.0	187.0	579	1:40000?	?	B/W	
	IGD1994b	1994	7/7	1-1 to 1-3	180.0	183.0	572	1:12000	Pacificorp	Color	
	IGD1994b	1994	7/7	2-1 to 2-6	181.0	186.5	572	1:12000	Pacificorp	Color	
	IGD1994b	1994	7/7	3-1 to 3-3	186.0	189.0	572	1:12000	Pacificorp	Color	
	IGD1994b	1994	7/7	4-1 to 4-4	181.0	192.0	572	1:12000	Pacificorp	Color	Missing 4-2 and 4-3
	IGD1994b	1994	7/7	5-1 to 5-2	188.7	190.7	572	1:12000	Pacificorp	Color	
	IGD1998a	1998	8/14	10481-146 to 10481-147	153.7	162.5	11120	1:40000	?	B/W	
	IGD1998a	1998	8/24	10485-158 to 10485-159	143.0	153.5	11120	1:40000	?	B/W	
	IGD1998a	1998	8/24	10485-171 to 10485-172	139.0	150.0	11120	1:40000	?	B/W	
	IGD1998a	1998	8/24	10489-47 to 10489-48	150.0	157.0	11120	1:40000	?	B/W	
	IGD1998b	1998	8/14	10481-166 to 10481-167	173.0	181.5	11120	1:40000	?	B/W	
	IGD1998b	1998	8/24	10485-138 to 10485-139	167.0	176.6	11120	1:40000	?	B/W	
	IGD1999a	1999	8/3	299-120 to 299-121	159.0	163.5	1230	1:24000	USDA	Color	
	IGD1999a	1999	8/3	299-158 to 299-160	161.5	165.6	1230	1:24000	USDA	Color	
	IGD1999a	1999	8/3	299-184 to 299-186	173.0	176.5	1230	1:24000	USDA	Color	
	IGD1999a	1999	8/3	299-211	170.5	175.0	1230	1:24000	USDA	Color	
	IGD1999a	1999	8/19	1199-109 to 1199-111	163.5	167.0	1130	1:24000	USDA	Color	
	IGD1999a	1999	8/19	1199-146 to 1199-148	167.5	173.0	1130	1:24000	USDA	Color	
	IGD1999a	1999	8/19	1199-178 to 1199-180	165.5	169.5	1130	1:24000	USDA	Color	
	IGD1999b	1999	8/3	299-43 to 299-44	152.5	156.3	1230	1:24000	USDA	Color	
	IGD1999b	1999	8/3	299-65 to 299-67	154.4	159.0	1230	1:24000	USDA	Color	
	IGD1999b	1999	8/3	299-100 to 299-102	156.5	161.7	1230	1:24000	USDA	Color	
	IGD1999b	1999	8/16	499-56 to 499-58	150.7	154.5	1130	1:24000	USDA	Color	
	IGD1999b	1999	8/16	499-?? to 499-??	148.0	152.5	1130	1:24000	USDA	Color	
	IGD1999b	1999	8/16	499-182 to 499-183	145.5	151.0	1130	1:24000	USDA	Color	

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DS IGD	IGD1999b	1999	8/16	499-204 to 499-207	142.0	148.0	1130	1:24000	USDA	Color	
	IGD1999b	1999	8/16	599-29 to 599-30	140.0	146.0	1130	1:24000	USDA	Color	
	IGD1999c	1999	8/16	599-56 to 599-58	138.0	142.0	1130	1:24000	USDA	Color	
	IGD1999c	1999	8/16	599-152 to 599-153	136	140	1130	1:24000	USDA	Color	
	IGD1999c	1999	8/16	599-175 to 599-176	133.7	138	1130	1:24000	USDA	Color	
	IGD2000a	2000	8/14	12286-35 to 12286-36	163	176	1060	1:40000	?	B/W	
	IGD2000a	2000	8/8	12278-60 to 12278-61	158	167	1060	1:40000	?	B/W	
	IGD2001a	2001	7/14	12763-43 to 12763-45	186.5	196	1010	1:40000	?	B/W	
	IGD2001a	2001	7/14	12763-48 to 12763-49	177	186.7	1010	1:40000	?	B/W	
	IGD2001a	2001	7/13	12763-48 to 12763-49	183	193.5	1010	1:40000	?	B/W	

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